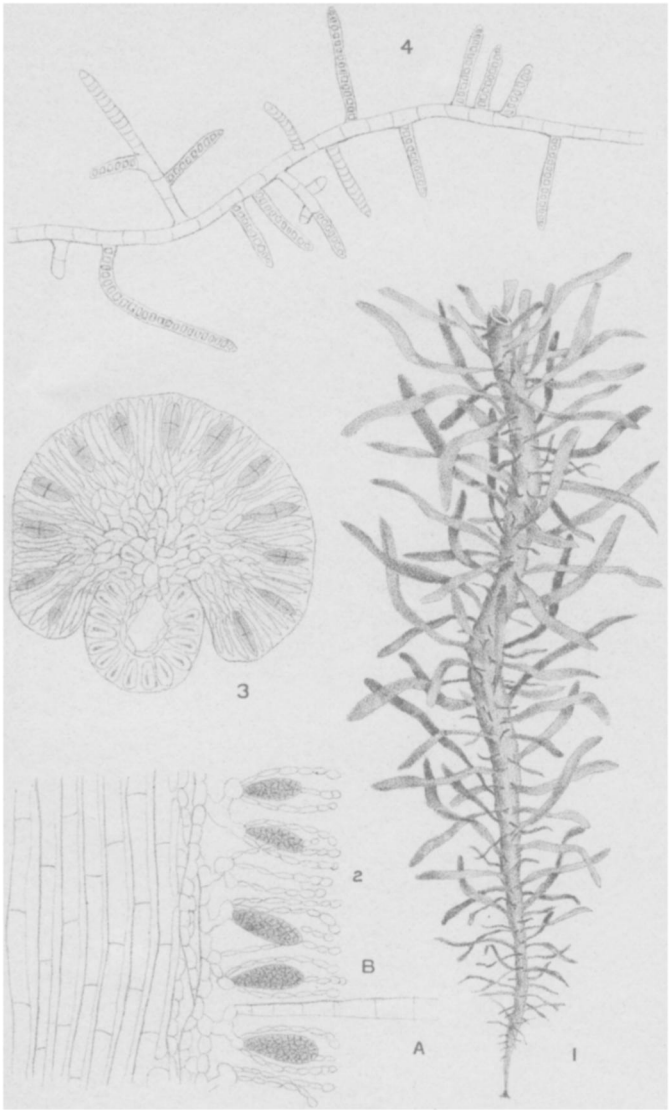
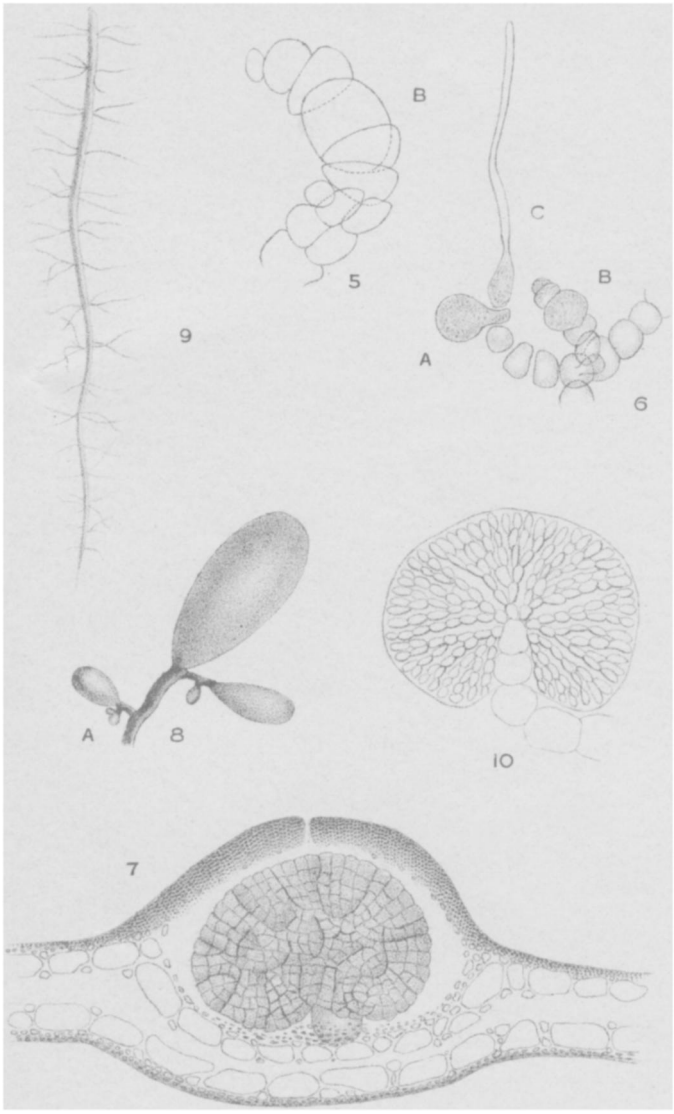


ON SOME MARINE ALGÆ. W.G. FARLOW.



ON SOME MARINE ALGÆ. W. G. FARLOW.

BULLETIN

OF THE

TORREY BOTANICAL CLUB.

Vol. XVI.] New York, January 12, 1889. [No. 1.

On Some New or Imperfectly Known Algæ of the United States. I.

By W. G. Farlow.

(Plates LXXXVII and LXXXVIII.)

Chrysymenia pseudodichotoma n. sp., pl. LXXXVIII, figs. 7 and 8.

Fronds 4 to 8 inches high, with discoidal base and a solid, cylindrical, cartilaginous stipe which branches monopodially and ends in ovate or obovate saccate extremities, ½ to 1 inch long, ¼ to ½ inch broad, at the bases of which unilateral branches are given off repeatedly and, elongating and forming new terminal sacks, cause the older parts of the stipe to appear to be dichotomous with more or less widely spreading and flexuous divisions. Cystocarps borne in the walls of the sacks, projecting externally and internally, with distinct carpostomes. Tetraspores?

Santa Barbara, Monterey, Santa Cruz and St. Vincent, Cal.

The determination of this species has caused much perplexity among American algologists. The first specimens seen were collected at Santa Cruz by Dr. C. L. Anderson in 1876 and were sterile. In them the saccate branches were numerous and the stipes comparatively short, so that there was a certain resemblance to species like *Chrysymenia obovata*, Sond., and the species was quoted under that name in Proc. Am. Acad. Arts and Sci., vii., 242*. Larger sets of specimens received later from Mrs.

*By a misprint as *Cryptonemia obovata*.

Bingham, Miss Lennebacker and Mrs. Bush showed that this determination was incorrect, and, in the absence of fruit, it was doubtful whether the plant was a *Chrysymenia* and might not be possibly the alga cited under the name of *Lomentaria saccata* in the Nereis Am. Bor. founded on Californian specimens of *Dumontia saccata* from Herb. Greville, and later transferred to the genus *Erythrocystis*, by Prof. J. G. Agardh. Through the kindness of Prof. Balfour, I have been able to examine the specimens of *Dumontia saccata* in Herb. Greville. There are two specimens marked "California, Douglas, Hort. Soc. Lond., 1833." Examination shows that both of these specimens, which are in fruit, are beyond doubt *Ricardia Montagnei*, Derbes. and Sol., similar in all respects to the specimens of *R. Montagnei*, var. *gigantea*, from California distributed in Alg. Am. Bor. Exs. no. 58. In the specimens of Douglas, as in those in Alg. Am. Bor., the *Ricardiæ* were growing on *Laurencia virgata*, as that species is understood by American algolgists.

The fruit of *C. pseudodichotoma* appears not to be common, but I have received from Mrs. A. E. Bush good fruiting specimens collected at Monterey, and the structure of the cystocarps as shown in plate LXXXVIII, fig. 7, confirms the opinion previously reached from an examination of the frond that the plant is a *Chrysymenia*. The figure, it should be said, was drawn from a section of a plant which had been pressed, and therefore the two sides of the sack are brought much closer together than they are in the living plant. The wall of the cystocarp is formed from the enlarged walls of the sack, and the spores are arranged around the carpogenic cell in a somewhat reniform mass composed of different lobules in which the spores are densely packed together, but arranged in short digitate moniliform rows, as can be seen by applying reagents. In fig. 8 the method of branching is shown. At the base of the largest sack which terminates the main stipe a branch is given off at right angles which also ends in a sack and the process is again repeated. At the point *a*, where another branch is given off, there is an indentation on the upper side of the angle formed with the main stipe which marks the spot where there had previously been a terminal sack which has now disappeared, so that the large sack of the figure which

appears to terminate the main stipe is really at the tip of an elongated lateral branch. The axis of the stipe is composed of large ellipsoidal or short cylindrical cells densely packed together and the cortex of a thin layer of polygonal colored cells. The sacks are much more succulent and more brightly colored than the stipe and the structure of their walls is sufficiently evident from fig. 7.

GLŒOSIPHONIA VERTICILLARIS, n. sp. Pl. LXXXVIII, figs. 5, 6, 9, 10.

Fronds usually gregarious, solid, becoming hollow with age, main axis filiform-cylindrical, finely attenuated towards the discoidal base, 2 to 8 inches long, about 1/8 inch in diameter, usually undivided and clothed throughout its length with whorls of 3 to 6 fusiform branches, 1/4 to 1/2 inches long. In some cases a few of the lower branches are transformed into secondary axes with whorls. Cystocarps numerous, immersed among the cortical filaments of the branches, destitute of proper envelope. Sporiferous mass simple with a thin gelatinous covering. Tetraspores ?

On stones in shallow coves, Santa Cruz, Cal.

This is another of the many interesting species discovered by Dr. Anderson. It is of a soft gelatinous substance and a beautiful rose color when fresh, but is so delicate that it is easily broken. The microscopic structure of the frond is like that in species of *Calosiphonia* and *Glœosiphonia*. There is a single axial filament of large cylindrical cells from whose central portions arise at right angles whorls of four branches which divide dichotomously. From the lower joints of the branches arise a series of descending filaments which interlace with one another and give compactness to the axis of the frond. By successive dichotomies of the horizontal whorls, the cells becoming shorter and rounder, there is formed a series of corymbose branches which make the cortex of the frond. The fructification is shown in Plate LXXXVIII, figs. 5, 6 and 10. The figures were drawn from alcoholic material collected by me in April, 1885. As far as I could judge from this material, the antheridia formed small spots on the surface of the fructiferous whorls, but, as I found them in only a few cases, it may be that the spots seen were not really antheridia. The procarps are abundant at the base of the

corymbose branches, and often occur in pairs. From fig. 6, which represents a procarp it will be seen that from a single basal cell arise a number of short branches. In fig. 6, two branches and a part of a third branch are seen, but the number is often greater than three. Of these branches only two, *ac* and *b* of the figure, are concerned in the production of the cystocarps. The other branches grow into short filaments with nearly spherical cells, and make their way amongst the filaments of which the frond is composed, their general direction being parallel to the surface of the frond. The branch *ac* bears at the tip the long hyaline trichogyne which makes its way, usually more or less twisted, between the corymbose branches to the surface. In the lower part it is very much constricted where it passes into the bulbous trichophore. Below the trichophore is the cell *a*, which pushes out to one side and becomes much enlarged. Its contents are darker colored and more granular than those of the neighboring cells, and I was unable to find that in any stage the bulbous portion was separated from the smaller portion by a cell wall. The sporiferous masses do not arise from the cell *a*, but from the cell *b*, which lies in a small branch close to that which bears the trichogyne. The cell *b* has densely granular contents like those of the cell *a*, and the branch is continued beyond *b* usually by two smaller, more nearly hyaline cells. In fig. 5 the later development of the branch of which *b* is the most prominent cell is shown. The two terminal cells remain nearly unchanged, but the cell *b* of fig. 6 divides into three cells, of which the central one, *b* of fig. 5, is larger and more nearly spherical than the other two which lie immediately above and below it. These three cells have dark colored contents. The lower cells of the branch enlarge somewhat and divide in a direction parallel to the length of the branch, and subsequently some of them develop into short moniliform branches similar to those already described.

The branch becomes curved, and the three dark colored cells, which are sometimes increased to four by an additional cross-division, are so arranged that the cell *b*, the real carpogenic cell, lies at the apex of convexity; *b* is then divided into two cells placed respectively on the concave and convex sides of the branch. The cell on the upper convex side is next divided by

longitudinal partitions into several wedge-shaped cells, which increase rapidly in size, and form a partial ring around the unchanged cell which is on the concave side. The wedge-shaped cells divide repeatedly until they are transformed into radiating filaments, each cell of which develops into a spore. A mature spore-mass is shown in fig. 10. The sub-moniliform spores are embedded in a mass of jelly which nearly encloses the carpogenic branch of which the lower portion is shown in the figure.

Although the present alga resembles somewhat species of *Nemalion* and *Nemastoma*, the central axial filament excludes it from *Nemastoma*, and the development of the cystocarps is not that of *Nemalion*. Considering the structure of the frond alone, it might belong either to *Calosiphonia* or *Glœosiphonia*. The radiating arrangement of the spores, which all mature at the same time, seems to warrant placing it in *Glœosiphonia*. The account of the development of the cystocarp given above, although deficient in an essential point, conforms better to what is known in *Glœosiphonia* than in any other genus. The trichogyne *c* and the hypogynous cell *a* of my fig. 6 agree with the account of *G. capillaris* given by Bornet in Notes Algol., i., 42, Plate XIII, 7, and by Fr. Schmitz in Sitzungsber. Berlin Akad. Wiss., x., Plate V, 8. According to Bornet the carpogenic cell is in close contact with the trichophoric apparatus. This appears not to be the case with *G. verticillaris*, in which the carpogenic cell is on a separate branch, more like the figure of Schmitz. I have been unable to ascertain the mode of contact between the trichophoric apparatus and the carpogenic cell, for I find nothing in my material which shows a growth of tubes like the *c* and *c*-1 in Schmitz's fig. 10. We cannot suppose that the fertilizing impulse is propagated down the whole length of the trichophoric branch and up to the cell *b* of fig. 6. As no connecting tubes were seen, it may be that the carpogenic branch when in its normal position curves closely over the trichophoric branch just below *a* and that a communication is there established. No dissections and no reagents which I have tried, showed this, however.

Nemalion Andersonii, Farlow. A description of this species was given in Proc. Am. Acad. Arts and Sci., vii., 235. Since

then I have received from Mr. C. C. Merriman a *Nemalion* from St. Kilda, Australia, which bears a strong resemblance to the Californian alga, and the question arises whether it may not be that both should be regarded as forms of *N. ramulosum*, Harv., described from New Zealand. I have no means of settling this point, but the strong resemblance of the two plants from opposite sides of the Pacific should be noted.

Hildenbrandtia rosea, Kg. . This species was first reported as occurring in this country in Rept. U. S. Fish Comm. for 1871. The same plant under the name of *H. sanguinea* appears to have been previously reported by Mr. J. L. Russell in 1856, in Proc. Essex Inst. i., 193, as occurring at Salem, Mass. *H. sanguinea*, *H. rubra* and *H. rosea* are all referred by Hauck to *H. prototypus*, Nardo.

Choreocolax Polysiphoniæ, Reinsch, Plate LXXXVIII, fig. 3. This species of the Atlantic shore of North America was described and figured by Reinsch in Contrib, ad Algolog, et Fungolog. In May, 1888, some specimens of *Polysiphonia fastigiata* were collected at Nahant by Mrs. R. S. Eigenmann. On the upper parts, especially at the dichotomies, were small hemispherical masses of a brownish color and cartilaginous consistency and hardly an eighth of an inch in diameter, which, on examination appeared to be without doubt Reinsch's species, although not agreeing in all respects with his figure. As far as I am aware, no fruit, either tetrasporic or cystocarpic, has previously been described. The specimens from Nahant contained tetraspores. The hemispherical external part of the frond consists of a mass of filaments composed of purple colored cells which branch and radiate to the surface, where they end in pyriform cells encased in a dense mass of jelly. The tetraspores are formed from the terminal cells and are usually cruciate, but not rarely tetrahedral.

Fucus edentatus, De la Pylaie. The *F. furcatus* of Marine Algæ of New England is without doubt the same as *F. edentatus* of Newfoundland, formerly united with *F. furcatus*, Ag., of the North Pacific, a species to which was also referred a *Fucus* of the northern coast of Norway. Later the two species were kept distinct by Prof. J. G. Agardh, and Kjellman in the Algæ of the Arctic Sea referred the so-called *F. furcatus* of Norway and

Greenland to *F. edentatus* where our common New England alga also belongs, although the *Fucus furcatus* of our west coast may perhaps be the same as the original *F. furcatus* of C. A. Agardh's Icon. Ined. *F. edentatus*, which is common from Boston northward, has recently also been found south of Cape Cod, at Groton, Conn., by Mr. W. A. Setchell. In the paper by Mr. W. M. Woodworth on "The Apical Cell of Fucus," Annals of Botany, i, the *F. furcatus* mentioned is in reality *F. edentatus*.

Fucus evanescens, Ag., was also found south of Cape Cod at Groton, Conn., by Mr. Setchell.

Fucus platycarpus, Thuret. This common European species, recognized by the monœcious conceptacles and margined receptacles, has only recently been recognized with certainty on our eastern coast. It appears to be not uncommon at Nahant, Mass., and is in good fruit in October.

Nereocystis gigantea, Aresch. A second species of *Nereocystis* from the coast of California was described by Areschoug in Bot. Notiser, 1876, p. 71, which in Bot. Notiser, 1881, p. 49, was made the type of a new genus, *Pelagophycus*. The two species of *Nereocystis* are certainly distinct, but in my own opinion they form one very natural genus from which *Pelagophycus* cannot be separated generically. The specimens described by Areschoug were collected near San Francisco by Dr. Eisen, and the same plant has been occasionally seen by Dr. Anderson at Santa Cruz, but, strange to say, the locality where it most abounds is much farther to the south, at Pt. Loma, near San Diego, Cal., and extending to Todas Santos Bay, in Lower California, where it was found by Mr. Orcutt and Mrs. Eigenmann. Near San Diego, according to Mr. D. Cleveland, it appears to be the only *Nereocystis* which occurs, certainly in any quantity. It is difficult drying specimens of this very succulent plant, and even in a climate as dry as that of California, it usually rots without drying, but, in the hotter air of Lower California, according to Mrs. Eigenmann, it is often found dried on the beach and the bladders are used for making a rough sort of lamp. *N. gigantea* differs from *N. Lütkeana* in having the fronds above the bladder, borne not on short pedicels, but on dichotomous stipes several inches long. Whether the ciliate margins are also specific is less certain, for,

in this respect, there are variations in both species. The following notes made by Mr. Cleveland will be read with interest, as he has had excellent opportunities for examining this species. The notes refer to a large specimen:

"Bladder 5½ by 6 inches in diameter, being slightly flattened, with wall ¾ inch thick, and a chamber cavity about 4½ inches in diameter. The base of the bladder narrows into a constriction 1½ inches in diameter, below which the bladder expands to 2¾ inches, gradually tapering for 4½ feet, where it is only ½ inch in diameter, when it narrows down for a foot to ⅜ inch, which diameter is kept for the remaining length of the stipe, in all about 90 feet, terminating in the hold-fast, which is about one foot in diameter. The spherical bladder-head has a channel about the size of a goose-quill leading into the lower and longer chamber, which is about two inches at the broadest part, gradually narrowing for about five feet, when the chamber ends and the stipe becomes solid. The upper bladder contained about one-half pint of water.

"Two long arms stretch out from the apex of the bulb to a length of 5 feet 6 inches. The common stem at the junction, or starting point, is 2 inches in diameter and about 2 inches long before the arms diverge. At the shoulder the arms are each 1¼ inch in diameter and narrow gradually to the tip. The arms send out single branchlets along their length at intervals of 7½ inches at the base to 14 inches near the tips, the spaces between these branches increasing towards the outer extremity of the arms. The two lower branches are about 11 inches long and fork once, the forks being about 7 inches long. The other branches also fork, each fork terminating in a leaf about 3 to 4 inches broad, and from 2 feet and upwards in length. The arms and branches are round at the base and gradually flatten as they approach the terminal leaves. The arms and branches bear a strong resemblance to the antlers of a large stag."

Nereocystis Lütkeana (Mert. fil.), Rupr. The common and long known bladder kelp of California does not make its appearance until summer and autumn, and, at the time of my visit in April and May, 1885, there was scarcely a trace of it to be seen. Miss Lennebacker, however, was so good as to present me with

a series of young plants which she had collected, which illustrated a very interesting point in the development. The young plants about 4 inches long are destitute of bladders, and look like young *Laminariæ* of the digitate section. The stipe is slender and short, and expands into a narrowly ovate lamina which soon becomes cleft, the divisions reaching nearly to the base. The young bladders begin to show themselves when the plants are about 8 inches long, and appear as obovate sacks at the tip of the stipe and bear on their upper margin the then comparatively broad, cleft lamina which as yet does not clearly show the divisions into two parts which is seen later.

Alaria esculenta (L.,), Grev., f. *musæfolia*, De la Pylaie, is said by Foslie in "Kritisk fortegnelse over Norges Hansalger," to be identical with *Fucus pinnatus* of Herb. Gunner.

Laminaria platymeris, De la Pylaie. Areschoug in Observations Phycologicæ, part iv., p. 2, states that this species is identical with *L. Cloustoni.*

Laminaria caperata, De la Pylaie, is said by Areschoug, l. c., p. 14, to be the true *L. saccharina.*

MESOGLOIA ANDERSONII Farlow, Pl. LXXXVII, fig. 2.

Fronds gelatinous, solitary or gregarious, cylindrical, 3-10 inches long, 1/8 inch in diam., repeatedly and irregularly dichotomous, secondary divisions occasionally subpinnate, tips scarcely attenuated, clothed with projecting hairs when young. Cortical filaments moniliform, erect, becoming somewhat recurved. Unilocular sporangia at the base of cortical filaments scattered uniformly over the surface of frond, pyriform, 36-45 μ by 18-21 μ.

On stones in shallow coves. Santa Cruz, Cal., Dr. Anderson 1875; San Diego, Dr. E. Palmer, 1875; Santa Barbara, Miss Lennebacker, 1877; Cape Mendocino, C. G. Pringle, 1882.

This species, first found by Dr. Anderson at Santa Cruz, was issued in Alg. Am. Bor. Exs., no. 163, in June, 1881. The first specimens received were sterile and the generic position could not be determined with accuracy. Fruiting specimens were received later and it was supposed when the alga was distributed in 1881, that the specimens in Alg. Am. Bor. were all fertile, but this could not have been the case, since a doubt has arisen whether the plant

really belongs to the Chordarieæ, and, in Till algernes Systematik* p. 76, Prof. J. G. Agardh, judging from the structure of the frond, suggested that it probably belonged in Sporochnoideæ near *Nereia*. The uniform distribution of the sporangia over the whole surface of the frond, not in verrucæform spots, shows however, that it belongs in Chordarieæ and not in Sporochnoideæ. But it is not so easy to decide upon the exact genus in which it should be placed, for algologists differ widely as to the limitation of the genera of Chordarieæ. The axis is composed of filaments of large cylindrical cells closely packed in the upper and younger parts of the frond which, in the lower part, becomes hollow with age. From these larger, colorless filaments are given off smaller filaments,which make their way to the surface of the frond where they ramify irregularly and from them are given off at right angles tufts of short, brownish filaments, which form the cortical layer. The latter are moniliform, at first erect, later somewhat recurved over the unilocular sporangia which are formed at their base.

Although the genus cannot be absolutely settled until the trichosporangia are better known, there being no indication of the secund outgrowths of the cortical filaments which mark the genus *Castagnea*, nor of the discoidal cells characteristic of *Cladosiphon* as limited by Prof. Agardh, l. c., p. 8, our plant must be referred either to *Mesogloia* or *Myriocladia*. Writers differ very much as to the distinctions between the two genera. According to Agardh, those species are placed in *Myriocladia* which have filaments that project beyond the cortical layer, and in which the cortical filaments in which the trichosporangia are formed, become moniliform, tapering at both ends. As far as the cortical filaments are concerned, *M. Andersonii* does not agree in structure with *Myriocladia*. The existence of filaments which project beyond the surface of the frond is the only mark which would lead one to refer it to *Myriocladia*. They, however, are only found in certain stages of growth, and in my specimens preserved in alcohol, are not to be seen, although they are to be found in a few young, pressed specimens.

Judging from published figures, *M. Andersonii* is closely re-

*Lunds Univers. Arsskrift, Vol. xxvii.

lated to *Mesogloia gracilis* Kg., Tab. Phyc., viii., Pl. X, which is retained in *Mesogloia* by Agardh. In Alg. Am. Bor. Exs., No. 163, the resemblance to *Mesogloia decipiens*, Suringar, of Japan was noted and, although I have not been able to examine specimens of that species, judging by Suringar's plate,* it still seems to me quite possible that the Japanese and Californian plants may be the same.

DICTYOSIPHON MACOUNII, n. sp., Pl. LXXXVII, fig. 1.

Fronds with an undivided axis, cylindrical-saccate, 2 to 6 inches long, ¼ to ½ inch in diam., tapering at the base, densely clothed throughout with subequal, hollow, fusiform or clavate branches, ½ to 1 inch long, about ⅛ inch in diam. Superficial cells small, 7 μ aver., irregularly polygonal, unilocular sporangia spherical, 38 to 42 μ in diam., scattered irregularly through the substance of the frond, not papillate at the surface.

Grande Vallée River, Gaspe, Quebec, Prof. J. Macoun, Nos. 16, 17, 34.

This species is coarser and stouter than any others of the genus, and the habit in well developed specimens reminds one of large specimens of *Chordaria abietina*, Rupr. In all the specimens in which the base was well preserved the fronds were attached to *Chordaria flagelliformis*, apparently a favorite habitat of species of this genus. The younger plants from one to two inches long were destitute of branches and, in this stage, might be mistaken for small specimens of *Scytosiphon lomentarius*. The habit when fully grown is well shown in Pl. LXXXVII, fig. 1, and the species is not likely to be mistaken for any other *Dictyosiphon* of our coast, for none of them, however much they may vary in size and general appearance, have the inflated axis and short, subequal branches of the present plant, which is less gelatinous than most other species, and in drying does not adhere well to paper.

ECTOCARPUS TOMENTOSOIDES, n. sp., Pl. LXXXVII, fig. 4.

Pulvinately expanded, filaments ¼ inch long, densely interwoven, sparingly and irregularly branched, 6 to 8 μ in diam., cells short, rarely twice as long as broad. Tricho-

*Musée Bot. de Leide, i, Pl. XXV.

sporangia borne in short, very numerous, straight or slightly falcate branches which diverge at right angles from the filaments, sessile, linear, 60 to 80 μ long by 6 to 7 μ broad, generally simple, occasionally pinnate.

On fronds of *Laminariæ*. Nahant, Mass. Mrs. R. S. Eigenmann.

This species, which forms short and dense patches on old *Laminariæ*, sometimes covering several inches, is evidently closely related to *E. tomentosus*, and it might be questioned whether it is not a young state of that species. Such cannot well be the case, for the specimens on which the species is founded were covered with the very abundant sporangia which indicate maturity. *E. tomentosus* forms characteristic rope-like masses several inches long, whereas the present species is not over a quarter of an inch long, and extends indefinitely over patches of considerable extent. Furthermore the filaments are from a quarter to a third narrower than in *E. tomentosus* and, although the sporangia are much like those of that species in some respects, they are in no instance recurved in the way so common in the sporangia of *E. tomentosus*.

EXPLANATION OF FIGURES.

Plate LXXXVII.

1. *Dictyosiphon Macounii*. Natural size.
2. *Mesogloia Andersonii*. B. Unilocular sporangia. A. Base of hyaline hair. × 500.
3. *Choreocolax Polysiphoniæ*, showing tetraspores. × 500.
4. *Ectocarpus tomentosoides*, showing trichosporangia. × 500.

Plate LXXXVIII.

5, 6, 9, 10, *Glæosiphonia verticillaris*. 9. A plant of natural size; 6. Procarp with trichogyne C, hypogynous cell A, and carpogenic cell B. × 600; 5, a later stage of the carpogenic branch of 6 showing the first divisions of the carpogenic cell B. × 600; 10. Section of a spore-mass attached to carbogenic branch. × 500.

7, 8, *Chrysymenia pseudodichotoma*. 8. Showing tip of stipe and sack-like branches, twice natural size; 7. Section of cystocarp. × 500.